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EDITORIAL.

Cattle Fodder.

An important limiting factor in stock keeping in Malaya is the provision of an adequate supply of suitable fodder for the animals. To maintain cows in a high condition of productivity, to ensure that cattle increase in weight economically, or to keep working animals in a state of perfect health, the fodder question is all important. Indigenous fodder in this country is generally inadequate, being poor in quality and frequently necessitating the expenditure of much of the animal's energy in procuring and digesting sufficient quantities.

For some time past investigations at the Department of Agriculture have therefore been directed to finding suitable fodders, rich and palatable for the animals, suitable for cultivation under Malayan conditions.

Guinea grass has been found to fulfil these conditions, but, as reported in this Journal some time back, to maintain the crop the application of from 10 to 15 tons of cattle manure per acre per annum is essential.

Parallel experiments have now been completed with Merker and Napier grasses and form the subject of an article in this number.

Cattle manure was applied at rates varying from 5 to 15 tons per acre per annum. With both grasses it was found that yields were almost directly proportional to the quantity of manure supplied, while there was a distinct tendency for yields to diminish with an increase in age of the stools. This tendency was most marked with the 5-ton rate of application of cattle manure. As in the case of Guinea grass there was a close correlation between yield and rainfall.

The intervals of growth between cutting were investigated, from which it was found that heavier yields may be obtained from longer cutting intervals, while the quality of the fodder was not materially affected by the longer periods of growth. Both Merker and Napier grasses gave greater yields on "light" than on "heavy" soil, but the response to manuring from Napier grass was twice as great as from Merker grass.

Comparing these two grasses with Guinea grass; while Guinea grass gives better results on soils of medium texture, Merker and Napier grasses should preferably be planted if the land is flat and the soil light in texture. The authors conclude that "assuming the grasses to be cut at six-weekly intervals it would appear unsafe on soils of the type normally encountered in Malaya to estimate for stocking at a rate exceeding 1¼ cows per acre. All manure would have to be returned to the land and none would be available for market gardening."

Original Articles.

A MANURIAL EXPERIMENT WITH MERKER AND NAPIER GRASSES

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Introductory.

The present article describes a manurial experiment with Merker grass (*Pennisetum Merkeri*) and Napier grass (*P. purpureum*) in Fields 9 and 10 at the Central Experiment Station, Serdang, where an experiment with Guinea grass (*Panicum maximum*) had already been carried out. The results of that experiment have been reported in this Journal. (1 & 2).

The work with Guinea grass showed that while a phosphatic manure, preferably basic slag, might be useful to start a new area, even moderate yields of grass could not be maintained by the application of artificial fertilizers alone, cattle manure at the rate of 10 to 15 tons per acre per annum being essential. If cattle manure from a dairy herd is to be put back on to the fodder grass areas at such high rates, it means in practice that there will be no surplus manure available for profitable outlets such as market gardening. The present experiment was initiated to ascertain whether somewhat coarser and more deeply rooting grasses would thrive on smaller dressings of cattle manure.

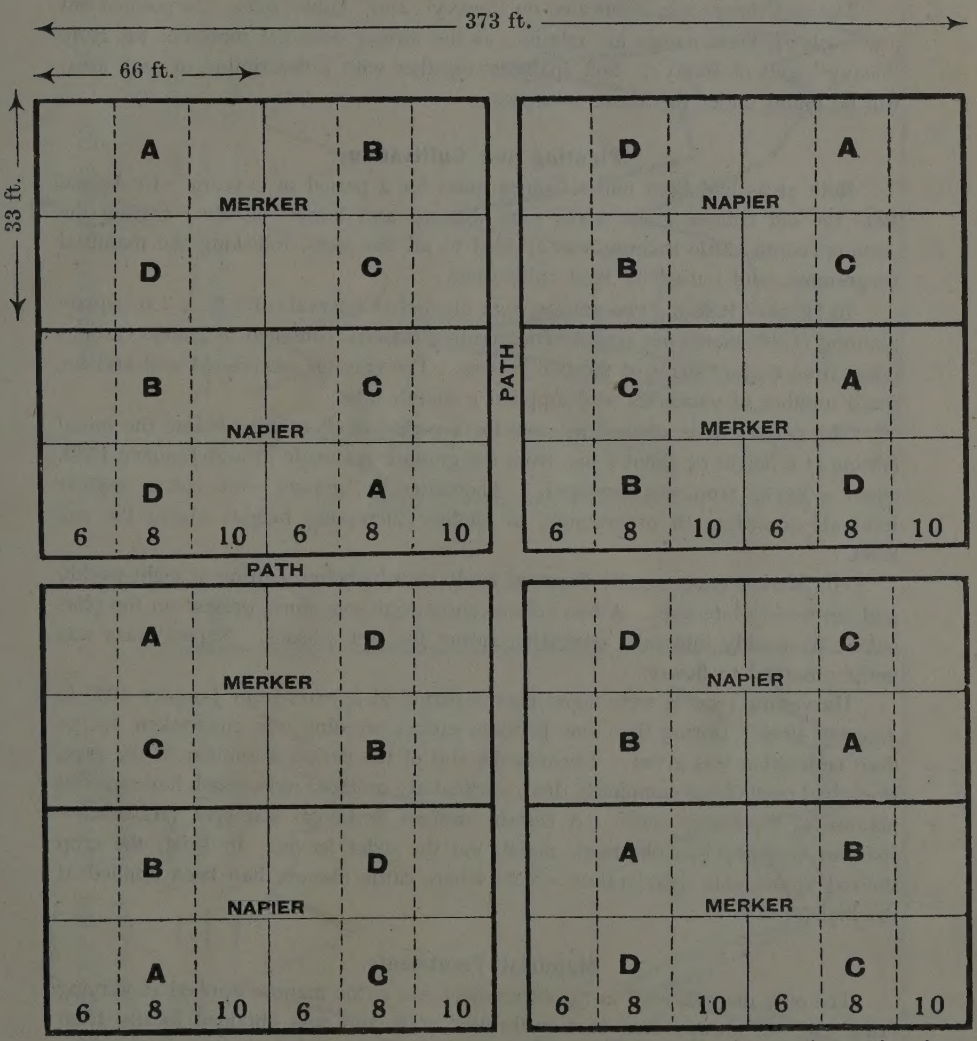
As was pointed out in the article on Guinea grass, quality, or nutritive value, is just as important as quantity, and arrangements were therefore again made for the chemical analyses of an extensive series of samples.

Since the interval between cuttings may affect both the quality and the quantity of the grasses it was decided to test three frequencies, cuttings being made at six-weekly, eight-weekly and ten-weekly intervals. Longer intervals were chosen than for Guinea grass on account of the slower rate of maturation of Merker and Napier grasses.

Lay-out of Experimental Plots.

A plan of the lay-out is shown in Diagram I. There were four blocks, each divided into two plots for the two grasses. The plots were further divided into four sub-plots for the four manurial treatments. Finally, these sub-plots were each divided into three sub-divisions for the three cutting intervals.

Diagram I.
Arrangement of Plots in Manurial Experiment with Merker and Napier Grasses.



KEY TO MANURIAL TREATMENT.

cattle manure per acre.
tons

A = 5
B = 7½
C = 10
D = 15

Note:—The figures denote the cutting intervals in weeks.

N

Single rows of grass were left as guard rows around and between each of these final sub-divisions. Thus the ultimate unit was a rectangle of an area of 0.01115 acres consisting of six rows of grass stools with nine plants in each row.

The experiment was duplicated on "heavy" and "light" soils. As pointed out previously(2), these names are relative, as the former does not represent the truly "heavy" soils of Malaya. Soil analyses, together with a description of each area, will be found under the above reference.

Planting and Cultivation.

Both areas had been under Guinea grass for a period of 6 years. In August 1938 the old Guinea grass stools were dug up and buried *in situ*. During the ensuing month cattle manure was applied to all the plots, following the manurial programme, and buried by light cultivation.

In October 1938 the two grasses were planted at intervals of 3 ft. x 3 ft. square planting (4,840 plants per acre). The planting material consisted of 3-node cuttings taken from mature stems of the two grasses. The cuttings established well and the small number of vacancies was supplied a month later.

The grasses were allowed to grow for a period of $3\frac{1}{2}$ months before the initial cutting at a height of about 4 ins. from the ground was made in mid-January 1939, when a heavy crop was removed. Thereafter the grasses were cut at regular intervals according to programme, at slightly increasing heights above the soil level.

The Merker grass usually flowered freely shortly before cutting at eight-weekly and ten-weekly intervals. A few inflorescences were sometimes present on the plots cut at six-weekly intervals, especially during the wet seasons. Napier grass was never observed to flower.

Harvesting records were taken over a period of 2 years from January 1939 to January 1941. During that time periodic surface weeding was undertaken but no deep cultivation was given. Towards the end of the period a number of the grass stools had partially or completely died, particularly on those plots which had received manure at the lower rates. A certain amount of fungal leaf spot (*Helminthosporium ocellum*) was observed, mainly on the older leaves. In brief, the crop showed appreciable deterioration except where cattle manure had been applied at the highest rate.

Manurial Treatments.

The only manure used in the experiment was cattle manure applied at varying rates. It was always used in a well-rotted state and was obtained locally from Indians who kept large herds of buffaloes. It contained a fairly large proportion of bedding, organic plant debris, and sand. Its relatively low manurial value is shown by the analysis of a typical sample given below:—

Figure 1.

MERKER GRASS ON HEAVY SOIL.

Cut at six-weekly intervals.

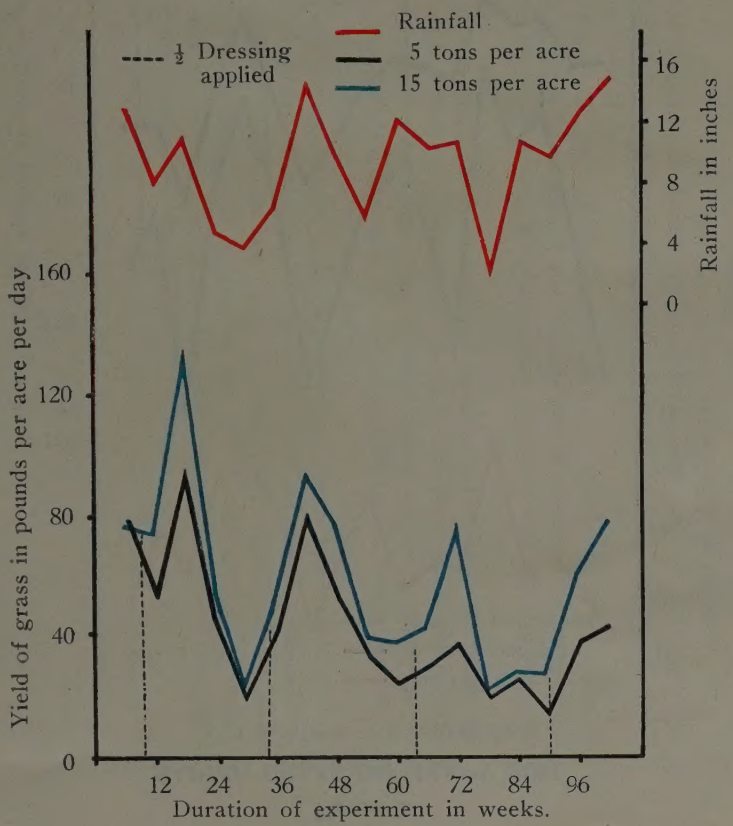


Figure 2.

MERKER GRASS ON LIGHT SOIL.

Cut at six-weekly intervals.

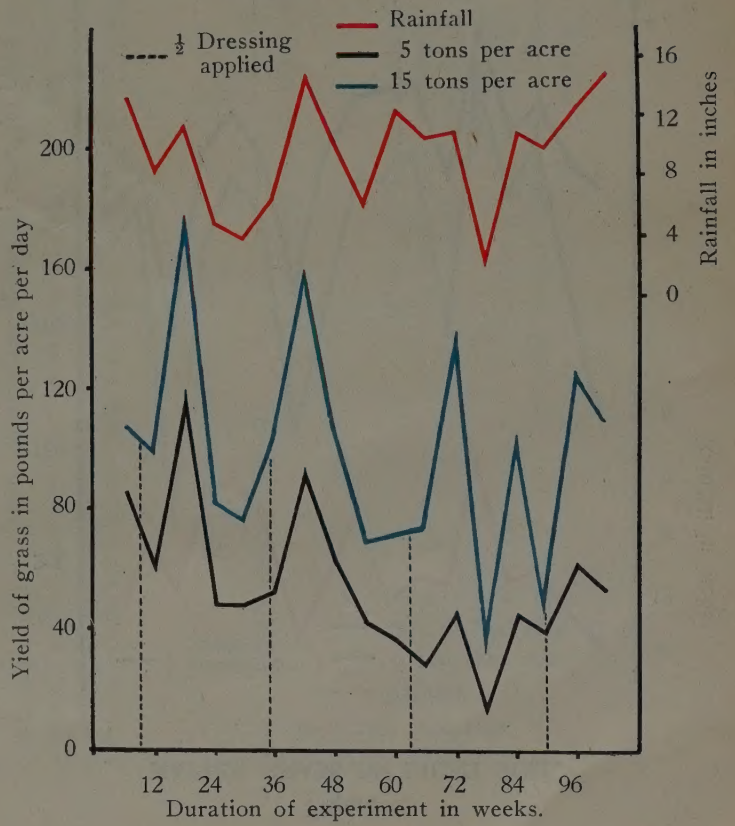


Figure 3.

NAPIER GRASS ON HEAVY SOIL.

Cut at six-weekly intervals.

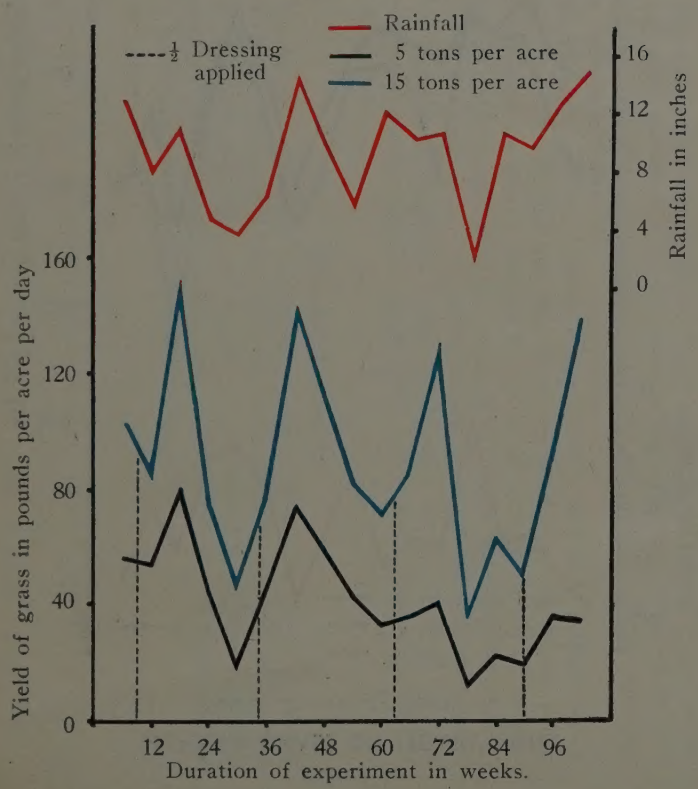
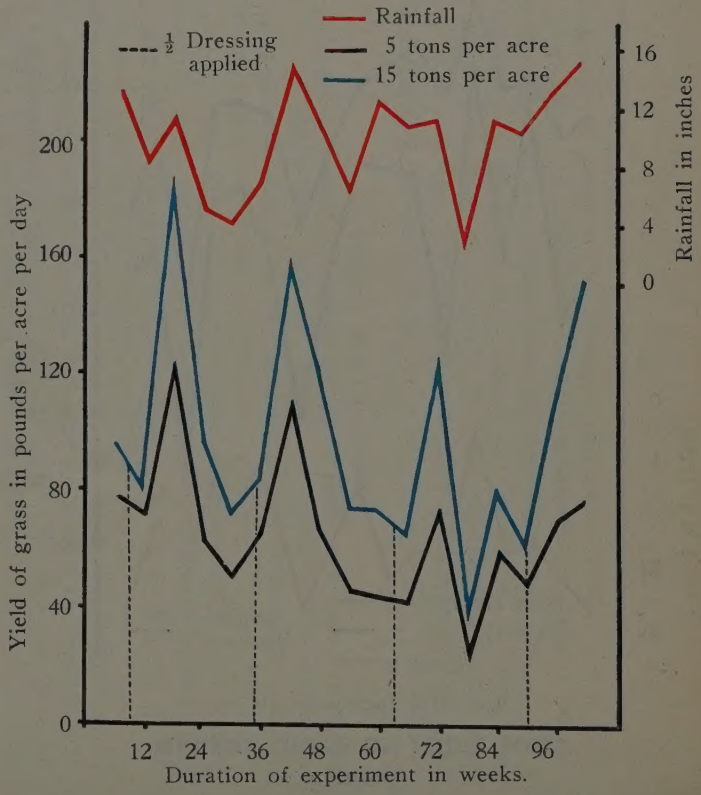


Figure 4.

NAPIER GRASS ON LIGHT SOIL.

Cut at six-weekly intervals.



	per cent.
Moisture	71.37
Organic and volatile (loss on ignition)	12.49
Residue (insoluble in acid)	12.90
Nitrogen (N)	0.40
Phosphorus (calculated as P_2O_5)	0.21
Potassium (calculated as K_2O)	0.25
Undetermined (by difference)	2.38
Total	100.00

The four manurial treatments were as follows:—

	tons per acre per annum.
A	5
B	7½
C	10
D	15

The cattle manure was applied at half the annual rate every six months starting with the initial application in September 1938. At the second and third applications the manure was buried in shallow trenches between alternate rows of grass. Subsequent dressings were spread between the plants and turned under by light cultivation.

Merker Grass.

A. Yields of Grass.

The yields of grass on the two types of soil are shown arranged by six-monthly periods in Table I. A summary showing the mean yields over the two-year period is shown in Table II.

With regard to Table II, statistical analysis is, strictly speaking, applicable only to the figures for the means of manurial treatments, randomization being limited to sub-plots; sub-divisions with different intervals of cutting were arranged in regular sequence.

The seasonal fluctuations and gradual deterioration in yield are shown in Figures 1 and 2, where the yields from individual cuttings at six-weekly intervals for the lowest and highest applications of cattle manure on both types of soil are expressed graphically together with the rainfall totalled for six-weekly periods.

From the results it may be observed that:—

(i) There has been a very appreciable response to increasing rates of application of cattle manure. Yields have been almost directly proportional to the quantity of manure applied. This has been most marked on the "light" soil where an increase of approximately 4 lbs. of grass per acre per day was obtained from every additional ton per acre per annum of cattle manure applied. The corresponding increase on the "heavy" soil was 2½ lbs.

Table I.
Average Yields of Merker Grass Cut at Varying Intervals.
(Results expressed in lbs. of grass per acre per day)

Period of Cutting	Annual Rate of Application of Cattle Manure											
	5 tons per acre			7½ tons per acre			10 tons per acre			15 tons per acre		
	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting
"Heavy" Soil												
January to July 1939 ...	63	72	60	59	79	79	62	78	78	79	95	93
July 1939 to January 1940 ...	43	52	54	42	62	78	39	51	74	55	72	105
January to July 1940 ...	32	29	27	37	45	46	34	36	44	49	48	61
July 1940 to January 1941 ...	27	28	30	37	49	50	36	46	48	43	50	65
Mean ...	41	45	43	44	59	63	43	53	61	57	66	81
	43			55			52			68		
"Light" Soil												
January to July 1939 ...	72	79	68	77	84	89	88	105	90	108	108	96
July 1939 to January 1940 ...	58	64	82	68	72	107	74	79	111	101	95	137
January to July 1940 ...	39	35	45	47	48	64	62	49	65	88	67	91
July 1940 to January 1941 ...	45	47	47	48	61	74	62	77	73	88	103	100
Mean ...	54	56	61	60	66	84	71	77	85	96	93	106
	57			70			78			98		

Table II.
Summary of Yields of Merker Grass for Two-Year Period.
(Results expressed in lbs. of grass per acre per day)

A. "Heavy" Soil

Annual Rate of Application of Cattle Manure tons per acre	Cutting Interval			Manurial Treatment Totals	Manurial Treatment Means
	Six-weekly	Eight-weekly	Ten-weekly		
5 ...	41	45	43	129	43
7½ ...	44	59	63	166	55
10 ...	43	53	61	157	52
15 ...	57	66	81	204	68
Cutting Interval Totals ...	185	223	248	656	
Cutting Interval Means ...	46	56	62		

Significant Difference for Manurial Treatment Means at 20:1 chance = 10.8 lbs.
Significant Difference for Cutting Interval Means at 20:1 chance = 9.4 lbs.

B. "Light" Soil

Annual Rate of Application of Cattle Manure tons per acre	Cutting Interval			Manurial Treatment Totals	Manurial Treatment Means
	Six-weekly	Eight-weekly	Ten-weekly		
5 ...	54	56	61	171	57
7½ ...	60	66	84	210	70
10 ...	71	77	85	233	78
15 ...	96	93	106	295	98
Cutting Interval Totals ...	281	292	336	909	
Cutting Interval Means ...	70	73	84		

Significant Difference for Manurial Treatment Means at 20:1 chance = 7.9 lbs.
Significant Difference for Cutting Interval Means at 20:1 chance = 6.9 lbs.

Table III.
Variations in Moisture Content of Merker Grass with Increasing Applications of Cattle Manure on Different Types of Soil and with Varying Intervals of Cutting.

Annual Rate of Application of Cattle Manure	"Heavy" Soil			"Light" Soil		
	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting
tons per acre	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
5 ...	76.5	77.4	74.6	80.3	74.6	70.9
7½ ...	78.4	77.4	76.5	79.3	73.7	70.9
10 ...	76.5	74.6	74.6	79.3	72.7	70.9
15 ...	78.4	76.5	74.6	79.3	73.7	72.7
Mean ...	77.5	76.5	75.1	79.6	73.7	71.4

Table IV.
Variations in Constituents of Merker Grass with Increasing Applications of Cattle Manure on Different Types of Soil and at two Intervals of Cutting.

(Moisture-free basis)

Annual Rate of Application of Cattle Manure	Six-weekly Cutting on "Heavy" Soil		Eight-weekly Cutting on "Light" Soil	
	Fibre	Calcium (calculated as CaO)	Protein	Phosphorus (calculated as P_2O_5)
tons per acre	per cent.	per cent.	per cent.	per cent.
5 ...	34.4	0.55	7.9	0.42
7½ ...	35.4	0.50	7.8	0.46
10 ...	35.2	0.53	7.7	0.45
15 ...	33.4	0.49	7.7	0.48
Mean ...	34.6	0.52	7.8	0.45

Table V.
Variations in Constituents of Merker Grass on Different Types of Soil with Increasing Interval of Cutting and Increase in Age of Stools.

(A) Moisture

Details of Six-monthly Cutting Period	"Heavy" Soil			"Light" Soil		
	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
January to July 1939 ...	78.5	79.0	74.5	78.0	76.6	73.6
July 1939 to January 1940	81.5	80.6	78.1	78.4	78.7	75.9
January to July 1940 ...	80.8	81.2	79.4	78.4	79.7	77.5
July 1940 to January 1941	83.1	81.7	78.4	81.5	80.5	75.9
Mean ...	81.0	80.6	77.6	79.1	78.9	75.7

(B) Protein

(Moisture-free basis)

January to July 1939 ...	9.4	8.8	6.6	9.4	7.8	6.8
July 1939 to January 1940	11.3	9.0	8.3	9.2	8.7	7.2
January to July 1940 ...	10.5	10.8	8.7	9.5	9.1	8.3
July 1940 to January 1941	11.2	10.0	8.1	10.7	9.9	7.9
Mean ...	10.6	9.7	7.9	9.7	8.9	7.6

(C) Fibre

(Moisture-free basis)

January to July 1939 ...	33.3	35.9	37.5	33.4	36.2	36.6
July 1939 to January 1940	31.5	33.4	35.0	32.4	33.4	34.6
January to July 1940 ...	32.0	33.7	34.5	32.0	34.2	35.8
July 1940 to January 1941	33.7	35.9	36.8	33.8	35.2	35.7
Mean ...	32.6	34.7	35.9	32.9	34.7	35.7

(D) Calcium

(Results calculated as calcium oxide (CaO) on a moisture-free basis)

January to July 1939 ...	0.47	0.43	0.39	0.48	0.44	0.45
July 1939 to January 1940	0.48	0.45	0.41	0.50	0.44	0.38
January to July 1940 ...	0.49	0.41	0.44	0.49	0.43	0.46
July 1940 to January 1941	0.50	0.44	0.45	0.63	0.41	0.52
Mean ...	0.49	0.43	0.42	0.53	0.43	0.45

(E) Phosphorus

(Results calculated as phosphoric acid (P_2O_5) on a moisture-free basis)

January to July 1939 ...	0.71	0.66	0.53	0.83	0.83	0.68
July 1939 to January 1940	0.66	0.74	0.71	0.83	0.89	0.68
January to July 1940 ...	0.70	0.73	0.59	0.90	0.94	0.81
July 1940 to January 1941	0.84	0.57	0.72	0.90	0.64	0.75
Mean ...	0.73	0.68	0.64	0.87	0.83	0.73

(ii) Significant increases in yield were obtained from the longer cutting intervals. The increases were larger on the "heavy" soil where plants cut at ten-weekly intervals gave a yield 35 per cent. greater than plants cut at six-weekly intervals. The corresponding increase on the "light" soil was 20 per cent.

(iii) Merker grass has given a mean yield 39 per cent. greater on the "light" soil than on the "heavy" soil.

(iv) On both soils there was a reduction in yield of the order of 40 per cent. during the second year of the experiment. This deterioration was least marked on the "light" soil where cattle manure had been applied at the rate of 15 tons per acre per annum.

(v) Throughout the experiment there was a close correlation between yield and rainfall on both soil types.

Further observations will be offered when comparing this grass with Napier grass.

B. Quality of Grass.

The quality of the grass will be considered in relation to the following constituents: (a) moisture, (b) protein, (c) fibre, (d) calcium, and (e) phosphorus.

During the first three months separate samples of grass were drawn on each occasion of cutting from each series of plots on both types of soil receiving a different manurial dressing, to ascertain whether the amount of any of the constituents mentioned above was being affected by the amount of cattle manure applied.

The figures in Tables III and IV which are a random selection of the results obtained show the absence of any definite relationship in these respects. For the remainder of the experiment, therefore, only one sample was drawn from each series of plots on both types of soil due for cutting on a particular date. Determinations of moisture, protein and fibre were carried out with each set of samples but, owing to the much greater amount of work involved, calcium and phosphorus determinations were carried out only with alternate samples. Analyses during the first three months had shown a narrow range of variation in respect of these two constituents and it is not considered, therefore, that the general conclusions drawn later are invalidated as a result of this restricted sampling.

The sampling and analytical procedures, the latter with a few minor exceptions, followed the same lines as those described for Guinea grass in Appendix 'A' of the paper referred to previously(2).

Tables VA, B, C, D and E show the average figures for the separate constituents mentioned above for each six-monthly cutting period on the two different types of soil and at the three intervals of cutting.

The following observations are offered in respect of the separate constituents:—

(a) *Moisture.*

(i) A slightly higher range of figures on the "heavy" than on the "light" soil.

(ii) A slight decrease in moisture content for both types of soil with increasing interval of cutting.

(b) *Protein.*

(i) A slightly higher range of figures for the "heavy" compared with the "light" soil.

(ii) A tendency for the protein content to decrease with increasing interval of cutting.

(iii) No relationship between protein content and increase in the age of stool.

(c) *Fibre.*

(i) The type of soil is without effect in respect of this constituent.

(ii) A slight increase in the fibre content with an increase in the interval of cutting.

(iii) No tendency for the fibre content to vary with an increase in the age of stool.

(d) *Calcium.*

(i) The calcium contents are of the same order for both types of soil.

(ii) A tendency for the amount of calcium to decrease with increasing interval of cutting.

(iii) No relationship between calcium content and increasing age of stool.

(e) *Phosphorus.*

(i) A higher range of figures for the "light" soil compared with the "heavy" soil.

(ii) A tendency for the phosphorus content to decrease with increasing interval of cutting.

(iii) No relationship between phosphorus content and increase in age of stool.

Combining the average figures for the different constituents, calculated on a moisture-free basis, with those for moisture content the average composition of the fresh grass on both types of soil for the three intervals of cutting can be calculated. The results are shown in Table VI. Observations on these figures will be offered when comparing this grass with Napier grass.

Table VI.
Average Amounts of Constituents of Freshly Cut Merker Grass on Different Types of Soil with Increasing Interval of Cutting.

Interval of Cutting	Type of Soil	Constituent				
		Moisture	Protein	Fibre	Calcium (calculated as CaO)	Phosphorus (calculated as P_2O_5)
Weeks		per cent.	per cent.	per cent.	per cent.	per cent.
6	"Heavy"	81.0	2.0	6.2	0.09	0.14
	"Light"	79.1	2.0	6.9	0.11	0.18
8	"Heavy"	80.6	1.9	6.7	0.08	0.13
	"Light"	78.9	1.9	7.3	0.09	0.18
10	"Heavy"	77.6	1.8	8.0	0.09	0.14
	"Light"	75.7	1.8	8.4	0.11	0.18

Napier Grass.

A. Yields of Grass.

The figures are presented in exactly similar form to those for Merker grass.

The detailed results are given in Table VII with a summary in Table VIII.

Yields from selected treatments, at the same interval of cutting, together with rainfall figures, are illustrated graphically in Figures 3 and 4. The following observations may be made:

(i) The response to increasing rates of application of cattle manure has been most marked. The yield of grass obtained has been almost directly proportional to the quantity of manure applied. On the "heavy" soil there was an increase of approximately 5 lbs. of grass per acre per day for every extra ton per acre per annum of cattle manure applied. The equivalent figure on the "light" soil was 4 lbs.

(ii) The longer cutting intervals have resulted in significant increases in yields. This has been more marked on the "heavy" soil where plants cut at ten-weekly intervals gave a yield 34 per cent. greater than plants cut at six-weekly intervals. The equivalent figure for the "light" soil was only 12 per cent.

(iii) Napier grass has given a mean yield 19 per cent. greater on the "light" soil than on the "heavy" soil.

(iv) On both soils there was a deterioration in yield of the order of 30 per cent. during the second year of the experiment. This decline was least marked on the "light" soil where cattle manure had been applied at the highest rate.

(v) Throughout the experiment there was a very close correlation between yield and rainfall on both soil types.

B. Quality of Grass.

The quality of the grass will be considered on the same basis as that used for Merker grass, *i.e.* (a) moisture, (b) protein, (c) fibre, (d) calcium, and (e) phosphorus.

A similar procedure to that described for Merker grass was also adopted during the first three months to ascertain whether there was any relationship between the amount of cattle manure applied and any of the constituents mentioned above, but without result.

The same system of sampling and analysis was followed as described for Merker grass.

Tables IXA, B, C, D and E. show the average figures for the separate constituents mentioned above for each six-monthly cutting period on the two different types of soil and at the three intervals of cutting.

The following observations are offered in respect of the separate constituents:—

(a) *Moisture.*

(i) A slightly higher range of figures for grass on the "heavy" than on the "light" soil.

(ii) A slight increase in moisture content for both types of soil with increasing interval of cutting.

Table VII.
Average Yields of Napier Grass Cut at Varying Intervals.
(Results calculated in lbs. of grass per acre per day)

Period of Cutting	Annual Rate of Application of Cattle Manure											
	5 tons per acre			7½ tons per acre			10 tons per acre			15 tons per acre		
	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting
"Heavy" Soil												
January to July 1939 ...	54	63	63	64	78	72	64	84	98	95	113	106
July 1939 to January 1940 ...	44	59	78	53	68	84	54	74	108	85	103	137
January to July 1940 ...	37	31	43	47	50	52	56	61	55	93	86	81
July 1940 to January 1941 ...	26	35	42	36	51	61	45	60	66	79	84	94
Mean ...	40	47	57	50	62	67	55	70	82	88	97	105
	48			60			69			97		
"Light" Soil												
January to July 1939 ...	76	75	69	88	94	92	92	85	92	102	105	101
July 1939 to January 1940 ...	67	68	80	78	77	107	88	82	118	99	100	140
January to July 1940 ...	52	48	43	64	55	56	73	63	63	86	80	86
July 1940 to January 1941 ...	58	55	60	71	74	78	67	82	92	92	109	117
Mean ...	63	61	63	75	75	83	80	78	91	95	98	111
	62			78			83			101		

Table VIII.
Summary of Yields of Napier Grass for Two-Year Period.
(Results expressed in lbs. of grass per acre per day)

A. "Heavy" Soil

Annual Rate of Application of Cattle Manure tons per acre	Cutting Interval			Manurial Treatment Totals	Manurial Treatment Means
	Six-weekly	Eight-weekly	Ten-weekly		
5 ...	40	47	57	144	48
7½ ...	50	62	67	179	60
10 ...	55	70	82	207	69
15 ...	88	97	105	290	97
Cutting Interval Totals ...	233	276	311	820	
Cutting Interval Means ...	58	69	78		

Significant Difference for Manurial Treatment Means at 20:1 chance = 5.9 lbs.
Significant Difference for Cutting Interval Means at 20:1 chance = 5.1 lbs.

B. "Light" Soil

Annual Rate of Application of Cattle Manure tons per acre	Cutting Interval			Manurial Treatment Totals	Manurial Treatment Totals
	Six-weekly	Eight-weekly	Ten-weekly		
5 ...	63	61	63	187	62
7½ ...	75	75	83	233	78
10 ...	80	78	91	249	83
15 ...	95	98	111	304	101
Cutting Interval Totals ...	313	312	348	973	
Cutting Interval Means ...	78	78	87		

Significant Difference for Manurial Treatment Means at 20:1 chance = 7.0 lbs.
Significant Difference for Cutting Interval Means at 20:1 chance = 6.1 lbs.

Table IX.
Variations in Constituents of Napier Grass on Different Types of Soil with Increasing Interval of Cutting and Increase in Age of Stools.

(A) Moisture

Details of Six-monthly Cutting Period	"Heavy" Soil			"Light" Soil		
	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting	Six-weekly Cutting	Eight-weekly Cutting	Ten-weekly Cutting
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
January to July 1939 ...	80.4	81.2	78.1	79.3	79.0	77.1
July 1939 to January 1940	82.4	82.8	79.9	80.8	80.3	78.0
January to July 1940 ...	82.1	81.5	81.7	79.9	78.7	80.3
July 1940 to January 1941	83.1	81.9	80.9	81.0	80.7	80.6
Mean ...	82.0	81.9	80.2	80.3	79.7	79.0

(B) Protein

(Moisture-free basis)

January to July 1939 ...	10.2	8.8	7.1	9.2	8.1	7.2
July 1939 to January 1940	10.9	11.1	8.8	9.8	10.6	7.9
January to July 1940 ...	11.1	11.7	8.9	9.3	8.7	7.0
July 1940 to January 1941	10.4	8.9	8.6	9.3	8.6	7.8
Mean ...	10.7	10.1	8.4	9.4	9.0	7.5

(C) Fibre

(Moisture-free basis)

January to July 1939 ...	31.7	32.6	36.0	32.3	33.7	36.0
July 1939 to January 1940	31.5	31.9	33.6	30.9	33.2	35.8
January to July 1940 ...	31.6	32.7	35.3	32.6	34.7	35.5
July 1940 to January 1941	33.5	33.9	35.1	33.9	33.7	35.9
Mean ...	32.1	32.8	35.0	32.4	33.8	35.8

(D) Calcium

(Results calculated as lime (CaO) on a moisture-free basis)

January to July 1939 ...	0.42	0.36	0.36	0.49	0.41	0.39
July 1939 to January 1940	0.55	0.38	0.43	0.43	0.37	0.35
January to July 1940 ...	0.43	0.43	0.34	0.45	0.43	0.41
July 1940 to January 1941	0.45	0.43	0.34	0.56	0.39	0.40
Mean ...	0.46	0.40	0.37	0.48	0.40	0.39

(E) Phosphorus

(Results calculated as phosphoric acid (P_2O_5) on a moisture-free basis)

January to July 1939 ...	0.61	0.61	0.50	0.82	0.76	0.68
July 1939 to January 1940	0.62	0.65	0.63	0.78	0.81	0.80
January to July 1940 ...	0.74	0.65	0.60	0.92	0.77	0.70
July 1940 to January 1941	0.81	0.69	0.64	0.97	0.61	0.74
Mean ...	0.69	0.65	0.59	0.87	0.74	0.73

(b) *Protein.*

(i) A slightly higher range of figures for the "heavy" compared with the "light" soil.

(ii) A tendency for the protein content to decrease with increasing interval of cutting.

(iii) No definite relationship between protein content and increase in the age of stool.

(c) *Fibre.*

(i) The type of soil is without effect in respect of this constituent.

(ii) A slight increase in the fibre content with an increase in the interval of cutting.

(iii) No tendency for the fibre content to increase with an increase in the age of stool.

(d) *Calcium.*

(i) The calcium content is of the same order for both types of soil.

(ii) A tendency for the amount of calcium to decrease with increasing interval of cutting.

(iii) No definite relationship between calcium content and age of stool.

(e) *Phosphorus.*

(i) A higher range of figures for the "light" compared with the "heavy" soil.

(ii) A tendency for the phosphorus content to decrease with increasing interval of cutting.

(iii) No relationship between phosphorus content and increase in age of stool.

Combining the average figures for the different constituents, calculated on a moisture-free basis, with those for moisture content the average composition of the fresh grass on both types of soil for the three intervals of cutting can be calculated. The results are shown in Table X. Observations on these figures will be offered when comparing this grass with Merker grass.

Table X.
Average Amounts of Constituents of Freshly Cut Napier Grass on Different Types of Soil with Increasing Interval of Cutting.

Interval of Cutting	Type of Soil	Constituent				
		Moisture	Protein	Fibre	Calcium (calculated as CaO)	Phosphorus (calculated as P_2O_5)
Weeks		per cent.	per cent.	per cent.	per cent.	per cent.
6	"Heavy" ...	82.0	1.9	5.8	0.08	0.12
	"Light" ...	80.3	1.9	6.4	0.09	0.17
8	"Heavy" ...	81.9	1.8	5.9	0.07	0.12
	"Light" ...	79.7	1.8	6.9	0.08	0.15
10	"Heavy" ...	80.2	1.7	6.9	0.07	0.12
	"Light" ...	79.0	1.6	7.5	0.08	0.15

Comparison of Merker and Napier Grasses.

The following observations are offered on the foregoing results:

A. Yields of Grasses.

(i) Both grasses have yielded more highly on the "light" soil, where the mean yields were 76 and 81 lbs. per acre per day for Merker grass and Napier grass respectively. The corresponding figures on the "heavy" soil were 54 and 67 lbs.

(ii) On both soils Napier grass has given a greater yield than Merker grass but on the "light" soil the increase amounted to only 7 per cent. and was not statistically significant. On the "heavy" soil, however, a significant increase of 24 per cent. was obtained.

(iii) The yield from both grasses was almost directly proportional to the quantity of cattle manure applied. On the "light" soil both grasses gave increases of approximately 4 lbs. per acre per day for every additional ton of cattle manure per acre per annum, but on the "heavy" soil the response from Napier grass was twice as great as from Merker grass. The corresponding increases were 5 lbs. per acre per day for Napier grass and $2\frac{1}{2}$ lbs. per acre per day for Merker grass. The lower rates of application of cattle manure gave disappointingly low yields.

(iv) Both grasses responded similarly to the increasing intervals between consecutive cuttings. On the "heavy" soil the increases from the ten-weekly cutting compared with those of the six-weekly cutting amounted to 35 and 34 per cent. for Merker grass and Napier grass respectively. The corresponding increases on the "light" soil were 20 and 12 per cent. respectively.

(v) During the second year of the experiment deterioration in yields of the order of 40 and 30 per cent. were recorded for Merker grass and Napier grass respectively. This falling-off in yield was least apparent on those areas of Napier grass which had received cattle manure at the rate of 15 tons per acre per annum. Reference to Figures 3 and 4 shows that the yields from these plots at the end of the experiment had returned to very nearly the same level as they were at the beginning.

(vi) Throughout the two-year period the yields of both grasses showed a close correlation with rainfall.

B. Quality of Grasses.

The differences between the two grasses are very slight.

(i) Merker grass tends to have a slightly lower moisture content but is slightly richer in mineral nutrients than Napier grass.

(ii) Both grasses grown on the "light" soil are slightly lower in moisture and protein, and richer in phosphorus, than on the "heavy" soil.

(iii) In the case of both grasses, an increase in cutting interval leads to an increase in fibre and decrease in moisture, protein, calcium and phosphorus.

Comparison with Guinea Grass.

Reference to the article on Guinea grass mentioned previously[2] shows that the average daily yields of this grass manured with cattle manure at the rate of

10 tons or more per acre per annum and cut at four-weekly intervals were 75 lbs. for the "heavy" and 55 lbs. for the "light" soils respectively.

In the case of both Merker and Napier grasses, higher yields were obtained on the "light" than on the "heavy" soil. Comparative yield figures for the three grasses are shown below. As regards Merker and Napier grasses, the calculated mean figures for 12½ tons (mean of treatments C and D) of cattle manure and the six-weekly cutting interval have been taken as the basis for comparison.

	"Heavy" Soil	"Light" Soil
	lbs. of grass per acre per day.	
Guinea grass	75	55
Merker grass	50	84
Napier grass	72	88

Guinea grass when cut at intervals of four weeks was both palatable and not unduly deficient in protein. The average figure of 2.6 per cent. for the fresh grass compares favourably with that of 3 per cent. published in literature for average meadow grass in Europe.

The protein content of both Merker and Napier grasses when cut at six-weekly intervals is lower than that of Guinea grass cut at four-weekly intervals; average figures being 2.0, 1.9 and 2.6 per cent. respectively.

Combining yields of grass and protein content the average daily protein yields per acre are as follows:—

	"Heavy" Soil	"Light" Soil
	lbs. of protein per acre per day.	
Guinea grass	1.95	1.43
Merker grass	1.00	1.68
Napier grass	1.37	1.67

Taking as a basis a daily ration (Indian breed of cattle) of 40 lbs. of Guinea grass per animal, equivalent to 1.04 lbs. of protein, the stocking capacities per acre of the three grasses on the two different types of soil are as follows:—

	"Heavy" Soil	"Light" Soil
	No. of cows.	
Guinea grass	1.8	1.3
Merker grass	1.0	1.6
Napier grass	1.3	1.6

If production of manure (including bedding) be taken as 40 lbs. per day (6.5 tons per annum) the maximum amounts of manure available for application would be as follows:—

	"Heavy" Soil	"Light" Soil
	tons per annum.	
Guinea grass	11.7	8.5
Merker grass	6.5	10.4
Napier grass	8.5	10.4

The above figures indicate, therefore, that while Guinea grass gives better results on soils of medium texture, Merker and Napier grasses should preferably be planted if the land is flat and the soil light in texture. The greater degree of success obtained with the latter grasses on land of relatively poor fertility is probably associated with their more deeply rooting habit.

Conclusions.

As in the case of Guinea grass, yield figures far below those commonly suggested, *viz.* 180 to 240 lbs. per acre per day (30 to 40 tons per acre per annum) have been recorded.

Assuming the grasses to be cut at six-weekly intervals it would appear unsafe on soils of the type normally encountered in Malaya to estimate for stocking at a rate exceeding $1\frac{1}{4}$ cows per acre. All manure would have to be returned to the land and none would be available for market gardening.

Summary.

1. Experiments designed to ascertain the response of Merker and Napier grasses planted on two different types of soil to increasing applications of cattle manure and intervals of cutting are discussed and the results are compared with those obtained for Guinea grass planted previously on the same areas.

2. The results show that the three grasses, calculated on a protein content basis, are of the same order as regards rate of stocking.

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2. Experiments with Guinea Grass at the Central Experiment Station, Serdang. *Malayan Agricultural Journal,* Vol. XXVI, No. 6, June 1938, page 224.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

2nd Quarter, 1941.

Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

In general, rainfall was heavy and well above average in most parts of the country during April and May. June, on the other hand, was an extremely dry month with rainfall below average. In Penang and Province Wellesley the first half of April was wet, the second half of April, the whole of May, and the first half of June excessively dry, with heavy rain in the middle of June. In Pahang, rainfall was below average except on the coast in April, but in May was above average except at Temerloh and on the coast; June was a dry month as elsewhere.

Prices.

Prices were high during the quarter, falling slightly in June, and are summarized in Tables I and II.

Coupon values remained approximately at the levels ruling in the first quarter. The general range was from $21 to $23.50 per picul equivalent, but in Kelantan coupons fell to $19.50 at the end of the quarter, and in Parit, Perak Central, they rose to $28.50 in May. In Kedah they ranged from $18 to $20.

In Pahang there has been little or no interest in scrap rubber for some years, but recently, in East Pahang, scrap, bark free, has been sold at $3 to $9 per picul according to quality, without coupons. In Johore Central, uncouponed scrap sold at $6 to $17 per picul.

The coupon issue rate for the quarter was 23 kati per unit, and the following table, extracted from the Perak report, shows the sale value per acre of coupons at an average price of $22 per picul equivalent in respect of the various classes of rubber.

Class	Units	Quantity	Sale Value of Coupons per acre.
		p. k.	$
Class A1	5	1 15	25.30
A	4	92	20.24
AB	3½	80½	17.71
B	3	69	15.18
BC	2½	57½	12.65
C	2	46	10.12
CD	1½	34½	7.59
D	1	23	5.06

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Malayan dollars per picul of 133 1/3 lbs.)

2nd Quarter, 1941.

Quality	Penang*	Perak*	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				APRIL					
Smoked sheet	46.00 - 49.50	43.00 - 47.50	42.00 - 47.20	44.00 - 47.00	41.50 - 47.20	46.50 - 48.70	44.00 - 47.30	38.50 - 47.60	43.80 - 47.50
Unsmoked sheet	44.00 - 47.00	39.00 - 46.00	42.00 - 44.40	40.00 - 46.00	40.00 - 46.00	45.50 - 47.00	42.50 - 46.50	37.50 - 46.00	41.00 - 45.50
Scrap	29.50 - 33.00	31.00 - 35.00	29.00 - 31.40	—	—	33.00 - 36.00	29.00 - 33.50	29.00 - 34.50	28.00 - 31.00
				MAY					
Smoked sheet	49.00 - 55.00	42.00 - 49.20	44.00 - 49.50	44.00 - 49.50	43.00 - 49.00	48.00 - 50.50	46.00 - 50.00	40.00 - 49.50	46.00 - 48.00
Unsmoked sheet	46.50 - 54.00	37.00 - 47.20	43.00 - 47.00	42.00 - 48.00	39.00 - 47.25	45.00 - 48.50	43.00 - 48.00	38.50 - 47.70	44.00 - 46.00
Scrap	30.00 - 35.00	31.00 - 35.00	31.00 - 33.80	—	—	32.00 - 37.50	31.00 - 36.00	31.00 - 37.00	29.00 - 31.00
				JUNE					
Smoked sheet	45.00 - 51.00	41.00 - 47.50	41.00 47.50	43.00 - 47.00	43.00 - 47.60	46.50 - 48.50	44.00 - 49.00	42.00 - 48.00	44.50 - 46.80
Unsmoked sheet	44.00 - 50.00	37.00 - 45.00	41.80 - 45.50	40.00 - 46.00	41.00 - 46.00	44.00 - 46.50	41.00 - 47.00	40.00 - 47.00	42.50 - 44.80
Scrap	30.00 - 34.00	31.00 - 32.00	22.25 - 32.50	—	—	30.00 - 35.00	28.00 - 36.50	27.50 - 34.50	27.50 - 30.00

*In Table I of the report for the first quarter (May, page 201) the headings of the second and third columns were reversed owing to a printers' error.

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Malayan dollars per picul of 133 1/3 lbs.)

2nd Quarter, 1941.

Quality	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				APRIL					
Smoked sheet	47.00 - 48.75	44.21 - 46.00	44.35 - 45.54	44.20 - 46.69	43.10 - 45.50	47.43 - 48.57	45.25 - 47.08	43.23 - 46.13	43.80 - 47.50
Unsmoked sheet	44.75 - 46.63	41.41 - 43.95	42.07 - 43.97	40.60 - 44.82	41.84 - 44.18	45.67 - 46.37	43.12 - 45.50	41.35 - 44.65	41.00 - 45.50
Scrap	30.17 - 31.33	31.00 - 35.00	29.80 - 31.20	—	—	34.17 - 35.17	30.00 - 32.50	30.27 - 32.43	28.00 - 31.00
				MAY					
Smoked sheet	49.50 - 53.00	44.81 - 48.16	45.55 - 48.20	45.80 - 49.10	44.81 - 47.45	48.67 - 49.67	46.63 - 49.48	45.70 - 48.69	46.00 - 48.00
Unsmoked sheet	47.50 - 50.88	42.30 - 45.07	43.83 - 46.67	43.30 - 46.70	42.42 - 45.45	46.67 - 47.50	44.12 - 47.58	43.47 - 46.68	44.00 - 46.00
Scrap	31.17 - 33.33	31.00 - 35.00	31.25 - 32.90	—	—	33.83 - 35.50	31.67 - 34.67	32.32 - 35.17	29.00 - 31.00
				JUNE					
Smoked sheet	46.50 - 50.50	43.79 - 45.91	44.12 - 46.47	43.94 - 46.66	43.76 - 46.48	46.60 - 47.67	44.75 - 47.38	44.57 - 45.62	44.50 - 46.80
Unsmoked sheet	45.00 - 48.50	41.11 - 43.58	42.90 - 45.17	41.80 - 44.66	41.64 - 44.44	44.43 - 45.67	42.38 - 45.25	42.37 - 44.78	42.50 - 44.80
Scrap	30.50 - 33.00	31.00 - 32.00	26.62 - 31.15	—	—	31.33 - 33.17	29.33 - 33.67	30.08 - 32.00	27.50 - 30.00

Table III.

Production of Rubber on Small Holdings.

(in tons)

	Total First Half-Year 1940	1st Quarter 1941	2nd Quarter 1941	Total First Half-Year 1941
Federated Malay States ...	51,190	19,432	27,211	46,643
Straits Settlements ...	7,712	3,944	4,952	8,896
Unfederated Malay States ...	48,854	22,536	29,387	51,923
TOTAL MALAYA ...	107,756	45,912	61,550	107,462

Production and Tapping.

Table III shows the production of rubber on small holdings during the quarter under review. It will be seen that there was a considerable increase (34 per cent.) in production when compared with the previous quarter, although total production for the half year was slightly less than for the corresponding period of 1940.

The results of the usual quarterly survey of small holdings are given in Tables IV and V, from which it will be seen that there was a substantial decrease in the percentage of holdings out of tapping when compared with the previous quarter. This increase in tapping was doubtless due to the higher prices ruling during the quarter.

In Pahang, padi operations in the *paya* areas and difficulty in obtaining coagulants in some centres were the principal factors limiting tapping.

A Perak report states that as the price of uncouponed rubber has remained high most small-holders are tapping continuously, and on many holdings tapping has been very heavy. In spite of this it is reported that the drastic over-tapping which was prevalent in Upper Perak at the beginning of the quarter is on the decrease. There was a marked decrease in the yield of latex during June probably due to the dry weather.

On Indian holdings in Selangor tapping is usually on contract, the rates being $11 to $12 per picul, including smoking and coagulant charges. On Malay holdings demands by Chinese tappers for two-thirds of the proceeds plus a share in the coupon issue are leading to greater employment of family labour.

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of June, 1941.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	5,400	15	Klang	16,143	4,200	26	Seremban	23,639	14,700	62	Raub	10,534	6,600	63
Kinta	38,874	8,600	22	Kuala Langat	23,881	5,300	22	Tampin	21,896	6,800	31	Kuala Lipis	15,457	900	6
Kuala Kangsar	92,166	9,200	10	Ulu Langat	45,012	7,700	17	Kuala Pilah	31,832	8,300	26	Bentong	12,224	1,200	10
Upper Perak	15,590	3,300	21	Ulu Selangor	31,463	4,100	13	Jelebu	9,097	800	9	Other Districts†	40,373	10,700	23
Larut & Selama	43,132	nil	0	Kuala Lumpur	20,277	4,100	20	Port Dickson	11,133	6,500	58				
Krian	9,408	5,400	57	Kuala Selangor†	8,417	1,600	19								
Lower Perak†	26,735	3,700	14												
Dindings	9,873	1,700	17												
	271,965	37,300	14		145,193	27,000	19		97,597	37,100	38		84,588	19,400	23

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	14,093	3,100	22	North	3,549	1,000	27	Singapore	20,115	800	4
Alor Gajah	30,838	9,900	32	Central	10,785	3,300	31				
Jasin	25,286	4,600	18	South	8,936	900	10				
				Penang	15,822	1,900	12				
	70,217	17,600	25		39,092	7,100	18		20,115	800	4

JOHORE	350,007	21,000	6
KEDAH	102,126	7,100	7
KELANTAN	49,133	11,300	23
PERLIS	2,916		
TRENGGANU ‡	29,836	4,900	

The percentage of areas out of tapping in December, 1940, was as follows:—Perak 15, Selangor 21, Negri Sembilan 43, Pahang 21, Malacca 39, Penang and Province Wellesley 15, Singapore 4, Johore 7, Kedah 12, Kelantan 31.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.

Comparisons of Areas of Rubber Small Holdings Out of Tapping

	June, 1940		March, 1941		June, 1941	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S. ...	165,700	27.6	133.200	22.2	120,800	20.0
S.S. ...	21,500	16.6	34,500	26.7	25,500	19.7
U.M.S. ...	67,600	12.7	57,600	10.8	44,300	8.3
Malaya ...	254,800	20.2	225,300	17.8	190,600	15.1

On a large number of Malay-owned holdings in Johore, tappers were employed and paid at the rate of 10 to 12 cents per kati of dry rubber produced. Unfortunately in nearly all cases where this system of tapping was employed efforts were made to extract as much latex as possible, regardless of the damage done to the trees by such drastic treatment.

In Negri Sembilan the most common method of employment amongst Malays is still the *bagi-dua* system, but in some cases owners lease their holdings to tappers.

Quality of Rubber and General Conditions on Holdings.

In Johore Central Circle there were increased sales of inferior scrap which was formerly not thought to be worth the trouble of collecting.

Two new smoke cabinets were erected in Kuantan District, Pahang, bringing the number in existence there to 105, of which about 75 per cent. are in regular use. Elsewhere in Pahang smoking is not general.

No change has occurred in the number of smoke cabinets in Kelantan, but comparatively few were in regular use; 71 sieves were sold through the Department.

In Selangor most of the rubber is sold as smoked sheet, although, as few Malays own smoke houses, the majority make use of smoke houses owned by dealers or contractors to whom a fee is paid which is more than covered by the premium obtained for the higher-grade product. A scheme has been launched by the Malay Instructor in Beranang (Selangor) area for co-operative smoking of sheet and for its marketing.

The erosion position in Selangor is not unsatisfactory although some Indian and Chinese holdings are slow in establishing their covers after clearing for replanting, particularly as the felled timber which normally would assist in checking erosion is frequently sold off as firewood.

There was little soil erosion on small holdings in Johore, except on a few newly-planted areas where the land had been given out without anti-erosion conditions.

It is reported that in Malacca improvement in the tapping system is maintained in the medium-sized holdings but in the Malay small holding excessive tapping still prevails. Clearing of secondary jungle and undesirable undergrowth has been carried out satisfactorily for fear of cuts in the coupon issue for holdings in poor condition.

In South Krian, Perak, more attention was paid to cleaning holdings. In Selama still more attention could be paid to soil conservation.

From Perak Central it is reported that the general improvement in the condition of rubber holdings continued. Many more owners have slashed the undergrowth. The number of holdings which are clean-weeded has also increased. The same report states that the erosion position on old rubber land has not changed, but erosion has been negligible because of the dry weather. Cover crops continue to be favoured for replanted areas although seed sowing is being held up until the coming of rain. A number of small-holders have terraced before replanting but some of them do not understand how it should be done and the terraces are very much off the contour. The great objection to proper terraces appears to be that the distances between the terraces cannot be constant and the owners do not like the look of trees planted at different distances apart.

The Pahang report mentions as a point which calls for commendation the fact that, where such measures are necessary, action against soil erosion is usually undertaken. This applies mainly to Chinese holdings in the hilly Bentong District, though there are still Chinese holdings in Raub on which operations which almost amount to clean-weeding continue on sloping land.

Planting and Budgrafting.

Budgrafting continued on newly-planted and replanted areas, in most cases under the supervision of the local Asiatic Rubber Instructors. In general the work of planting and budding appears to have been done well and reflects credit on the Small-Holders Advisory Service of the Rubber Research Institute.

In Johore 506 yds. of budwood were distributed from Departmental nurseries during the quarter. Certificates were issued to all persons who had purchased budwood from the Department's nurseries.

At Kuantan, Pahang, there was some difficulty in obtaining budwood as the nurseries at a local estate are now exhausted. Several small-holders in Temerloh, Pahang, budded and then decided not to cut back as, they allege, they are unable to keep away wild pig and monkeys which damage the young shoots. Their decision, in spite of the efforts of the Asiatic Rubber Instructor, appears to be influencing their neighbours.

In North Pahang, budding is often done on contract; in one case a flat rate of 8 cents per success is charged and the budder provides all materials including budwood. The practice is open to abuse. The importance of, firstly, making quite sure of the source of the budwood and, secondly, having secured genuine budwood, of supervising the budding to ensure that the budwood obtained is actually used has been stressed on the small-holders by the Asiatic Rubber Instructors. The first is normally assured as the local Asiatic Rubber Instructor usually obtains the required budwood from a reliable source but the second point can be achieved only by personal supervision by the small-holder.

The Pahang report also indicates that the after-care of new or replanted holdings sometimes leaves much to be desired. The realization needs to be brought home to the small-holder that the scale of assessment for a budded stand is based on the understanding that a reasonably good standard of maintenance (not forgetting manuring) has been observed, and that a Rubber Regulation Inspector may, at some future date, recommend an assessment below the standard rate in the case of budded but manifestly poorly grown rubber. The Rubber Regulation Inspector would very probably be fully justified in so doing but dissatisfaction and disappointment would result. Registers of all new and replanted holdings are kept by Asiatic Rubber Instructors in which a brief note is made of the condition of the holding at each visit and these records should be helpful later in cases of disputed assessment.

The impossibility of obtaining barbed wire is proving to be an obstacle to replanting in Pahang. There is a reluctance to use jungle timber for fencing and in point of fact a good jungle timber fence is not particularly inexpensive and is laborious to erect. Prospective replanters are trying to acquire old barbed wire.

The preference of Indian rubber growers (Chettiars) in Temerloh for clonal seed continues.

In Kelantan nearly 1200 yds. of budwood were sold during the quarter, and about 66 acres of newly-planted small-holding rubber were budded during the same period. Budwood was also supplied to medium estates. The skill of Malay budders compared unfavourably with that of experienced Chinese, and in several instances successes were only slightly over 30 per cent.

Budding is becoming more popular amongst small-holders in Negri Sembilan, and orders have been booked for 4,235 yds. of budwood, of which 1,315 yds. have already been supplied. Cultivation of catch crops on areas being replanted is very popular and no attempt is being made to discourage this practice except in cases where soil erosion is likely to result.

The Perak report states that satisfactory progress is being made with replanting in most districts, though the high price of uncouponed rubber has caused some small-holders to postpone replanting. In Kinta, however, this effect has been partly counteracted by the high price of firewood which has made the felling of old rubber very cheap and even profitable. It is pointed out that replanting is confined almost entirely to those holdings whose owners are sufficiently well off to afford the expense entailed. The growth of budded rubber on small holdings in Sitiawan is reported to be very good; manuring has been undertaken on many of them.

The Selangor report gives the following figures for areas on small holdings which have been budded: Malay 202 acres, Chinese 2,117 acres, Indian 850 acres. A number of small-holders in Selangor are establishing their own budwood nurseries; fifteen such nurseries are reported from Ulu Langat District. Budding contractors are increasing their prices, which now vary from $3\frac{1}{4}$ to $3\frac{1}{2}$ cents per success; the reason given is the increase in the price of budding cloth and wax. Contractors who use coconut frond charge $2\frac{1}{2}$ cents per success but the method is less reliable.

Manuring is a regular feature on Chinese- and Indian-owned holdings in Selangor and quantities of the recommended fertilizers were purchased during the quarter, often through the services of the Asiatic Rubber Instructors. Chinese small-holders' purchases amounted to $11\frac{3}{4}$ tons. Unfortunately the position as regards Malay holdings which have been replanted is less satisfactory, and many show signs that manuring has been neglected.

The Controller of Rubber is now supplying weekly lists of permits to replant. This greatly facilitates advisory work and it enables Asiatic Rubber Instructors and Agricultural Assistants to visit the land before the usual initial mistakes are made.

Pests and Diseases.

A few mild cases of secondary leaf fall (*Oidium Heveae*) are mentioned in some reports.

Mouldy Rot was prevalent during the wet months of April and May, and sales of approved fungicides were made through the Department. Conditions improved with the dry weather experienced in June and the disease was eradicated.

Root diseases remain prevalent in many parts of the country and every effort is made to encourage the owners to dig out the roots of old infected trees before planting, but very often the work is not thoroughly done with the result that it is wasted. The Selangor report states that tree to tree inspection and treatment with copper sulphate solution are being increasingly adopted.

Giant snails and slugs were responsible for destroying budshoots on newly planted areas, and, in the absence of "Meta", control was difficult. In one instance where slugs were doing extensive damage permission to turn in the established cover crop was granted in order to control the attack.

Rats and termites are also mentioned as having caused damage, and in Pahang a solitary rogue elephant has eaten up completely catch crops of banana and sugar-cane and caused incidental damage to young rubber.

General.

There was little or no demand for latex in the Segamat District of Johore, and small-holders reverted to the manufacture of sheet rubber.

The installation of an electric fence on a European-owned estate in the Segamat District to protect young rubber from elephant and other wild animals attracted considerable attention, and several enquiries were received from small-holders who wished to take similar precautions.

Malay small-holders from Segamat and Muar Districts visited the R.R.I. Experiment Station at Sungei Buloh, Selangor, accompanied by their respective Asiatic Rubber Instructors.

The annual *mukim* rubber competitions were held at a number of centres in Pahang and some very good sheet was entered.

Co-operative marketing from Jenderam, Selangor, continues, and small-holders there are now purchasing supplies of fungicides and coagulants on a co-operative basis. The Malay Instructor is now teaching them to grade before selling their sheet.

In some parts of the Peninsula a shortage of acetic acid was experienced during the quarter and, in Pahang, sales had to be made through the Department of Agriculture to alleviate the situation. The price demanded for bottled acid has often been in excess of the gazetted price, and village shopkeepers have not been willing to carry stocks as the margin of profit is small. The small dealers are not in a position to deal directly with the principal importers but obtain supplies from intermediaries, *i.e.* their normal source of general goods, who are entitled to and often do charge the full gazetted price, so that a price above the legal limit is charged by the small dealers in order to cover freight and make a profit.

Rubber dealers who also sell coagulants may refuse to supply them unless the would-be purchaser at the same time brings sheet for sale. The remedy here has been to recommend for a coagulant licence non-rubber dealing shops and to advise the small-holders to purchase from such shops. Although it is difficult to obtain irrefutable evidence, there appears little doubt that for the convenience of their customers who have credit accounts, unlicensed shops are selling a few bottles of acid, above the legal price. Although by so doing the sellers are not acting in accordance with the law, the arrangement appears to be mutually convenient to both parties.

Sulphuric acid is still being sold in some districts at high prices. In Pahang, coagulants other than acetic and formic acids are available but small-holders do not evince much interest in them. In Parit, Perak, the shortage of coagulants led to an increase in production of lump rubber.

Notes and Comments.

COCONUT ESTATES AS GRAZING GROUNDS FOR CATTLE.

In the *Straits Times* of 14th June, Mr. R. Paton shows how, under certain circumstances, coconut estates can assist the Government scheme for the storage of meat on the hoof by keepng Balinese oxen which are being imported into this country for the purpose. Two prerequisites are mentioned, *viz.* suitable grazing and a good water supply. The area, he states, must be under a mixed cover, a combination of any of the following:— *Centrosema pubescens*, *Mimosa pudica*, grasses (6 or 7 varieties), Nephrolepis ferns, all of which are palatable to Balinese oxen. Practically all types of local grass are freely eaten, including young *lalang*, while *Centrosema pubescens* is taken with relish. *Mimosa pudica* and Nephrolepis fern, provided the latter is young and tender, will be eaten if nothing else is available.

Mr. Paton favours tethering as the most suitable method, for it is thus possible to graze a greater number on the area available; the degree of trampling can be regulated, and as the animals cannot graze selectively, the pasture is improved. Supervision and inspection of individual animals is greatly facilitated, and the animals become very docile and easy to handle. An argument against the tethering system is that it entails a greater amount of labour for moving and watering the cattle. From 25 to 30 animals appear to be as many as one man can tend on this system.

Balinese oxen do not require to be housed at all, so it is a simple matter to organize the grazing round, and there is no necessity for the constant driving to and fro, between sheds and grazing grounds.

Each animal should be tethered by about 30 ft. (depending on planting distance of palms) of half-inch Manila rope, the length of rope required for the loop around the palm being additional. The loop should be fairly loose and should be tied in such a way that it cannot tighten.

The animals are tethered to alternate palms in alternate rows. The area thus allowed for each animal will suffice for anything up to 4 or 5 days, according to the nature of the pasture, by which time he should be moved to another spot.

The herd may be followed by a cultivation gang, who weed out any undesirable vegetation and at the same time mulch husks and fronds into surface drains and spread heaps of decaying husks on the surface. A disc harrow then passed up and down each row for a few turns is most satisfactory.

Regarding water for the animals, Mr. Paton recommends the provision of watering-troughs at suitable places throughout the grazing area, so that they can be used in rotation; or as an alternative, to water each animal individually by buckets.

Following this treatment, Mr. Paton has found that the pasture recovery has proved sufficient to carry the herd again in eight weeks — during a spell of very dry weather. Where the mixture contained a proportion of *Centrosema pubescens* this developed again very strongly and more rapidly than the grass.

In order to graze at two monthly intervals on the tether system an average coconut estate could graze from 400 to 600 head per 1,000 acres, according to the nature of the pasture.

CATTLE KEEPING.

The Department of Agriculture has published a new Leaflet, No. 6 in the Livestock and Poultry Series, under the above title. It has been designed to assist Europeans and English-speaking Asiatics who wish to keep cows to provide fresh milk for their household, and describes in simple terms the principles of cattle keeping. Copies may be obtained free of charge in Malaya on application to the Department of Agriculture, Kuala Lumpur.

Departmental.

FROM THE DISTRICTS.

Compiled in the office of the Chief Field Officer from Monthly Reports of Agricultural Officers.

July, 1941.

The Weather.

In Kelantan in coastal areas the rainfall was above average. Inland conditions were dry.

Elsewhere in the Peninsula the dry weather experienced during June continued during the first half of July. Towards the end of July the weather broke in a number of centres and heavy rain fell. The total precipitation by the end of the month was up to or in excess of the average at many places.

Crop Reports.

Rubber. — The price of rubber remained steady throughout July at $44 to $46 per picul (133⅓ lbs.) for smoked sheet.

The situation with regard to supplies of coagulants continues to be unsatisfactory. Insufficient supplies of acetic acid are available on the market to meet the demand of small-holders. Inferior types of coagulants containing sulphuric or other acids are still in use and are selling at fancy prices. In one instance an exporter reported that a quantity of inferior tacky sheet was coming from small holdings in one area in Perak and it is probable that this was due to the use of inferior coagulant. This smoked sheet has been realizing $5 to $7 per picul less than the standard market price.

Padi. — In North Kedah cultivation has been held up by the dry weather.

In Krian, at the beginning of the month, water supplies were very short, conditions were becoming critical and it was feared that nurseries would die. The rain came in time to save the situation and cultivation is now in progress. Some of the higher areas however are still without water. Owing to shortage of irrigation water, supplies were withheld for a time from padi land in Briah, in Selinsing and Semanggol areas. At the time the Agricultural Officer wrote his report supplies to part of Briah mukim had begun again and it was anticipated that the remainder of Briah as well as the mukims of Selinsing and Semanggol would be supplied early in August. These areas are mainly second class padi land and reduction of crop from these areas due to shortage of water would not be so great as in high yielding areas. Seasonal rat destruction work is being undertaken with good effect. During the month 6,400 rats were killed in organised hunts. Large quantities of poison baits were also distributed.

At Sungei Manik water supplies in Stages I and II have been satisfactory and cultivation has made good progress. In Stage III every effort has been made to get the cultivators to clear all *belukar* and timber. Though some work still remains

to be done, a great deal has been completed and the improvement is most marked. It should be possible to get most irrigable land in this Stage planted this season. In Stage IV good progress is being made with clearing and burning.

In the Changkat Jong area, which is being settled by Chinese colonists, there has been some delay in carrying out colonization, with the result that progress in opening up the area is rather slow. The weather at present is not very suitable for burning off the felled timber.

In the Panchang Bedena area, Sabak Bernam, clearing and burning is in progress on the re-alienated areas. Burning of a new area at Sungei Nipah was nearly completed by the end of the month. In the Tanjong Karang area, Kuala Selangor, burning and clearing has made fair progress at Sawah Sempadan. At Sungei Burong it was not possible to carry out burning on the date fixed owing to wet weather. It is now feared that it may no longer be possible to carry out burning effectively. At Sekinchang no burning has yet been done and it is probable that only some 300 acres will be planted. It is expected that Sawah Sempadan and a part of Sungei Burong areas will receive irrigation water this season.

In Negri Sembilan water supplies are adequate and cultivation is proceeding.

In Malacca there have been good falls of rain and there is now sufficient water in all parts to start cultivation. Many padi planters, who have been disappointed in the past two seasons owing to drought and to crop failure due to acid formation in the soil, have been very reluctant to start work.

In Kelantan conditions for planting dry padi have been good. Late in the month some heavy falls of rain held up final cultivation and sowing. Rat destruction in Pasir Puteh District was pursued energetically and nearly 18,000 rats were killed in three acres.

Tobacco. — Prices remain high and fresh areas are being planted. In Malacca cigarette factories have now come to an agreement with growers and the price has been stabilised at around $50 per picul. This crop is still grown mainly by Chinese. The Agricultural Officer, Malacca, is trying to encourage Malay cultivators to take up tobacco planting. Special attention is to be paid to this crop in school gardening and a few beds are to be planted in each school.

Water-melons. — The growing of water melons has recently become an important industry among Malay cultivators in Province Wellesley. Previously a poor local type was cultivated and large numbers of good quality melons were imported from Thailand. Now the Thailand type is grown and the market is supplied entirely from the locality. Growers obtain $5 per picul for the crop.

Livestock.

The price of pigs has risen to $25 per picul and there is a brisk demand. Bran is now plentiful and the price has also dropped. As a result pig-rearing prospects are at present promising.

In Selangor coast areas small-holders' interest in stock-keeping continues to increase, both cattle and goats being reared. The number of goats exported from the Bernam peninsula during July was 329, an increase of 98 head as compared with last month and more than double the number of 3 months ago.

DEPARTMENTAL NOTES.

Retirement of Inche Mohamed Noor bin Hamzah.

Inche Mohamed Noor bin Hamzah retired on 31st July 1941 after more than 30 years service in the Department of Agriculture. He joined the service in 1911 since when he has been stationed in many parts of the country, principally in Perak, Penang and Kedah.

The wide knowledge of agricultural conditions which Inche Mohamed Noor acquired in the course of his service fitted him to fill his latest appointment of Junior Lecturer, School of Agriculture, Malaya, which post he had held for the past nine years.

During his career in this Department, Inche Mohamed Noor has acquitted himself with credit. By his retirement the Department loses a valuable officer, but we feel sure that in his private capacity his knowledge and experience will always be freely given to his countrymen. His colleagues wish him many years of happiness in his well-earned retirement.

Leave.

Mr. J. W. Jolly, State Agricultural Officer, Negri Sembilan, has been granted 238 days leave from 18th July 1941 to 12th March 1942.

Mr. J. L. Greig returned from leave on 11th July 1941, and assumed duty as State Agricultural Officer, Negri Sembilan, with effect from 18th July.

Mr. N. C. E. Miller, Entomologist, returned from leave on the 4th August, 1941.

Mr. T. W. Brown, Botanist, has been granted 150 days leave from 23rd July 1941.

Appointment.

Mr. H. L. Barnett, Assistant to Agricultural Economist, has been seconded for duty with the Passive Defence Services with effect from 6th August 1941. Mrs. T. E. Mitchell, B.A. (Oxon.) has been appointed to act as Assistant to Agricultural Economist.

Statistical.

MARKET PRICES.

July, 1941.

Rubber. — The Singapore market was notably stable during the month, fluctuations not exceeding $\frac{1}{4}$ cent. No. 1. X. Ribbed Smoked Sheet opened at $38\frac{5}{8}$ cents per lb. and closed at the same figure, after falling to $38\frac{1}{2}$ for the greater part of the month and rising to $38\frac{3}{4}$ on the 23rd July only.

The average of daily quotations for the month was 38.56 cents per lb., as compared with 39.43 cents in June. The London average price was 13.36 pence per lb., and New York 22.05 cents gold, as compared with 13.58 pence and 21.71 cents gold in June.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, July, 1941.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak					Kuala Pilah, Negri Sembilan				Batu Pahat, Johore.				
	2	9	16	23	30	3	10	24	31	2	9	16	23	30
Smoked Sheet ...	44.38	44.30	44.70	44.45	44.83	—	—	—	45.00	—	43.30	43.50	43.81	—
Unsmoked Sheet ...	42.27	41.74	42.30	41.50	40.28	43.00	42.00	43.00	—	42.00	40.60	40.30	—	41.35
Scrap ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul; by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8 per ton.

Transport from Batu Pahat to Singapore by lorry, excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases at Kuala Pilah on 17th July.

Table II.

Singapore Prices of Various Agricultural Products.

Product	July, 1941			June, 1941	Average Price 1940
	Highest	Lowest	Average	Average	
	per picul $	per picul $	per picul $	per picul $	per picul $
Copra :					
Sundried ...	2.65	2.50	2.58	2.50	3.08
Mixed ...	2.40	2.25	2.33	2.25	2.76
Coconut Oil ...	—	—	—	8.75‖	8.29
Copra Cake No. 1 ...	2.55	2.55	2.55	2.35	1.43
No. 2 ...	2.30	2.30	2.30	1.76	‡
Pineapples, Canned :*					
G.A.Q. : Cubes ...	4.85	4.85	4.85	4.85	4.85
Sliced ...	4.80	4.80	4.80	4.80	4.80
Tall ...	4.95	4.95	4.95	4.95	4.95
Golden : Cubes ...	5.45	5.45	5.45	5.45	5.45
Sliced ...	5.40	5.40	5.40	5.40	5.40
Tall ...	5.55	5.55	5.55	5.55	5.55
Coffee :					
Liberian ...	17.50	17.50	17.50	17.00	16.10
Excelsa ...	14.50	14.50	14.50	14.00	13.69
Robusta ...	12.50	11.50	12.30	11.00	8.92
Palembang ...	21.00	18.00	18.10 - 21.00	18.19 - 20.00	13.00†
Sourabaya ...	23.50	21.00	21.07 - 23.25	19.69 - 21.62	14.80†
Arecanuts :					
Best ...	10.00	9.50	9.81	8.50	5.65
Medium ...	9.50	9.00	9.31	8.00	5.24
Mixed ...	9.00	8.75	8.87	7.19	4.88
Splits ...	10.75	6.75	7.64 - 10.45	6.75 - 8.94	6.33†
Red Whole ...	16.50	12.00	13.15 - 15.00	13.00 - 15.25	6.67†
Sliced ...	26.50	16.00	18.70 - 21.95	24.38 - 28.75	10.79†
Pepper :					
Singapore Black ...	7.50	7.25	7.34	7.25	7.29
Singapore White ...	15.00	14.00	14.31	14.25	‡
Muntok White ...	15.75	15.25	15.44	14.94	13.51
Nutmegs :					
110's ...	22.00	20.75	21.19	22.00	26.11
80's ...	24.00	24.00	24.00	25.00	30.65
Penang, dried¶ ...	—	—	15.00	15.00	21.00
Mace :					
Siouw ...	‡	‡	‡	‡	‡
Ambbina ...	40.00	39.00	39.25	‡	39.85
Penang, dried¶ ...	—	—	40.00	37.00	63.50
Cloves :					
Zanzibar ...	41.00	41.00	41.00	39.88	‡
Amboina ...	42.00	42.00	42.00	41.25	‡
Penang, dried¶ ...	‡	‡	‡	‡	72.00

* per case of 48 cans of 1¼ lbs. each. † Highest of the average monthly range quotations.

¶ Penang prices. ‡ Not quoted ‖ In new drums

Product	July, 1941			June, 1941	Average Price 1940
	Highest	Lowest	Average	Average	
	per picul $	per picul $	per picul $	per picul $	per picul $
Gambier:					
Block ..	‡	‡	‡	‡	‡
No. 1 Cube ...	12.50	12.50	12.50	14.50	15.00
Sago:					
Pearl ...	8.60	8.25	8.39	8.48	7.79
Flour, Sarawak Fair ...	4.60	4.00	4.26	4.58	4.95
Tapioça:					
Flake Fair ...	7.25	6.50	6.81	7.12	8.08
Seed Pearl ...	9.25	9.00	9.13	8.25	9.45
Medium Pearl ...	9.00	8.50	8.75	8.00	9.07

Palm Oil. — No recent information is available regarding prices paid in the United Kingdom for Malayan palm oil.

Local sales of palm oil in sellers' drums were made during July at the following price per ton:— unbleached oil 5 per cent., f.f.a., f.o.b. Singapore $180.

Rice. — The Singapore average wholsale prices of rice per picul in July were as follows:— Thailand Broken 1st Grade "A" $6.92. Thailand Broken 2nd Grade "A" $6.67, Burma S.Q. Meedone $6.54, Burma Parboiled Milchar No. 2 $5.67. Thailand 3rd Grade "A" and Annam White Rice No. 1 were not quoted.

The April average retail prices of No. 2 Thailand rice in Singapore and Penang were 46 and 45 cents per gantang (gallon) respectively. The May price in Singapore was 50 cents. Penang and Malacca were not quoted.

The average declared trade value of imports during April was $6.10 per picul, and during May $6.22, as compared with $6.30 in March and $6.37 in February.

Tea. — There are no London tea sales.

The latest Colombo prices available, quoted from *The Ceylon Tea Market* Report of 22nd July 1941 of the Colombo Brokers' Association are as follows, in rupees per lb.: High Grown Rs. 1.32, Medium Grown Rs. 1.21, Low Grown Rs. 1.09.

Cardamoms. — Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 21st July 1941, from Rs. 1.90 to Rs. 2.06 per lb.

Padi. — The Government Rice Mills, Perak, are paying a guaranteed price of $2.50 per picul for padi, plus a bonus of 10 cents per picul for pure strain S.K. 48 padi. There were again no purchases of padi at the Government Rice Mill, Temerloh, Pahang.

Retail prices of padi in cents per gantang (gallon) were as follows:— Penang and Province Wellesley 13¼; Perak Central 15 to 20, Perak South 11 to 14, Kinta and Batang Padang 18 to 20; Selangor, (coast districts) 12 to 14, (Kuang) 15 to 16; Pahang North 15 to 20; Pahang South 16 to 22; Kelantan 16; Negri Sembilan 18 to 22, (Kuala Pilah) 12 to 15, Seramban 22 to 26½; Malacca 15 to 18; Johore North 20 to 25; Brunei (*kampong*) 22, (town) 24.

Derris. — The Singapore market for this commodity showed a slight improvement, the upward tendency of June having been maintained. Average prices for July per picul were as follows:— $10.50 to $12 for roots sold on a basis of ether extract; $19.50 to $24 for roots with 4 to 5 per cent. rotenone content, rising to $28.50 to $30 for 7 to 9 per cent. rotenone.

Tobacco. — Prices of prepared tobacco per picul in Kelantan were: 1st quality $100 to $150, 2nd quality $80 to $120, 3rd quality $75 to $90. Prices of dried leaf per picul were as follows:— Penang and Province Wellesley 1st quality $63, 2nd quality $43; Perak Central 1st quality $85 to $90, 2nd quality $60 to $70, 3rd quality $35 to $60; Perak South $85 to $95, $70 to $85, $60 to $75, prepared tobacco $1.30 to $1.60 per kati; Pahang North $80 to $90, $64 to $80, $35 to $70; Pahang South $28 to $45; Selangor, cut tobacco $1.50 to $2.40 per kati. Negri Sembilan $60 to $90, $40 to $60, $15 to $30.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co., Ltd., Kuala Lumpur, local palm oil prices by Whittall & Co., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at 2s. 4d.

Note. — The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1941	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January	1,872.7	1,221.4	3,094.1	170.3	150.0	320.3
February	1,698.3	993.2	2,691.5	167.1	179.3	346.4
March	2,179.8	1,710.1	3,889.9	180.5	274.9	455.4
April	1,993.0	1,870.8	3,863.8	176.3	204.0	380.3
May	1,878.0	2,022.3	3,900.3	95.2	219.0	314.2
June	2,763.7	2,173.9	4,937.6	63.0	214.0	277.0
Total	12,385.5	9,991.7	22,377.2	852.4	1,241.2	2,093.6
Total January to June 1940	12,384.4	12,836.5	25,220.9	2,394.6	2,615.1	5,009.7
Total for the year 1940	29,875.2	28,096.9	57,972.1	4,513.1	5,098.1	9,611.2

Stocks on estates as at 30th June 1941 were: palm oil 3,379 tons, palm kernels 1,933 tons.

FERTILIZER PRICES, AUGUST, 1941.

The following are the prices current for the month of August 1941 of the more important fertilizers of which stocks are available.

	per ton $	
Nitrate of soda	185	
Muriate of potash	200	
Rock phosphate (Christmas Island)	40	($36 Singapore).
Lime	15	

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang.

Supplies of sulphate of ammonia, superphosphate, basic slag, calcium cyanamide, sulphate of potash, and rock phosphate (Gafsa) are not available.

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 30th June, 1941.

State or Territory	Estimated Acreages of Tappable Rubber (9)+(11)	Acreages of tappable rubber not tapped: On estates which have entirely ceased tapping		On estates which have partly ceased tapping (a)		Area of tappable rubber never been tapped (b)		Total area not tapped (3)+(5) (c)		Total area Tapped during the month		Area of tappable rubber rested under rotational systems (c)	
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)	Acreage	Percentage of (11) to (2)	Acreage	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S.S.—													
Province Wellesley ...	42,062	nil	nil	4,716	11.2	288	0.7	4,716	11.2	37,346	88.8	7,824	18.6
Malacca ...	108,831	368	0.4	7,097	6.5	672	0.6	7,465	6.9	101,366	93.1	16,616	15.3
Penang ...	2,596	nil	nil	441	17.0	35	1.3	441	17.0	2,155	83.0	60	2.3
Singapore ...	28,889	2,008	6.9	4,437	15.4	341	1.2	6,445	22.3	22,444	77.7	1,670	5.8
Total S.S. ...	182,378	2,376	1.3	16,691	9.2	1,336	0.7	19,067	10.5	163,311	89.5	26,170	14.3
F.M.S.—													
Perak ...	271,578	392	0.1	12,127	4.5	2,259	0.8	12,519	4.6	259,059	95.4	29,469	10.9
Selangor ...	298,204	986	0.3	11,782	4.0	2,608	0.9	12,768	4.3	285,436	95.7	30,271	10.2
Negri Sembilan ...	243,418	1,471	0.6	18,201	7.5	3,413	1.4	19,672	8.1	223,746	91.9	20,076	8.2
Pahang ...	84,959	688	0.8	6,872	8.1	2,192	2.6	7,560	8.9	77,399	91.1	3,157	3.7
Total F.M.S. ...	898,159	3,537	0.4	48,982	5.4	10,472	1.2	52,519	5.8	845,640	94.2	82,973	9.2
U.M.S.—													
Johore ...	465,508	5,844	1.3	34,958	7.5	16,208	3.5	40,802	8.8	424,706	91.2	46,029	9.9
Kedah ...	185,506	3,666	2.0	7,450	4.0	3,802	2.0	11,116	6.0	174,390	94.0	22,243	12.0
Kelantan ...	30,506	403	1.3	4,552	14.9	911	3.0	4,955	16.2	25,551	83.8	2,024	6.6
Trengganu (d) ...	4,817	nil	nil	nil	nil	nil	nil	nil	nil	4,817	100.0	1,493	31.0
Perlis (e) ...	1,337	nil	nil	190	14.2	89	6.7	190	14.2	1,147	85.8	274	20.5
Brunei ...	6,142	nil	nil	1,017	16.6	260	4.2	1,017	16.6	5,125	83.4	722	11.8
Total U.M.S. ...	693,816	9,913	1.4	48,167	7.0	21,270	3.1	58,080	8.4	635,736	91.6	72,785	10.5
Total Malaya ...	1,774,353	15,826	0.9	113,840	6.4	33,078	1.9	129,666	7.3	1,644,687	92.7	181,928	10.3

Notes.—(*a*) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(*b*) The acreage shown in column (7) is included in columns (3) and (5).

(*c*) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore (11) and (12) include columns (13) and (14) respectively.

(*d*) Registered companies only.

(*e*) Figures for the quarter ending 30th June, 1941.

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JUNE, 1941, IN DRY TONS.

State or Territory	Stocks at beginning of month			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated		Imports				Exports including re-exports				Stocks at end of month			Consumption	
								during the month		January to June 1941		during the month		January to June 1941						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to June 1941	during the month	Jan. to June 1941	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to June 1941
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	7,589	16,153	16,623	93,319	5,657	46,643	Nil	Nil	Nil	Nil	15,205	8,381	*80,001	*63,182	...	7,084	15,202	150	847
Johore ...	...	3,124	6,191	7,717	44,785	7,548	*35,507	Nil	94	Nil	*163	2,255	10,850	16,268	61,790	...	5,452	6,117	...	...
Kedah ...	...	691	4,046	3,908	22,835	1,608	9,403	Nil	Nil	Nil	Nil	807	4,893	7,262	25,476	...	741	3,812	...	...
Perlis ...	..	37	31	18	123	43	200	Nil	Nil	Nil	Nil	Nil	59	Nil	319	...	42	28	...	...
Kelantan ...	...	461	502	491	2,721	648	3,783	Nil	Nil	Nil	Nil	230	789	*1,134	*5,010	...	528	555	...	...
Trengganu ...	...	96	135	204	1,219	376	2,339	Nil	Nil	Nil	Nil	5	608	20	3,502	...	38	160	...	...
Brunei ...	...	17	58	73	387	166	691	...	...	...	...	...	268	...	1,076	...	...	46	...	...
Total Malay States	...	12,015	27,116	29,034	165,389	16,046	*98,566	Nil	94	Nil	*163	18,502	25,848	*104,685	*160,355	...	13,885	25,920	150	847
S. SETTLEMENTS :—																				
Malacca ...	...	1,976	1,570	1,568	9,425	833	5,354	Nil		Nil		2,699		*18,052		...	1,971	1,603	...	...
Province Wellesley	...	2,792	746	648	3,617	428	1,709	Nil		Nil		13,407		68,489		...	2,329	727	...	...
Penang ...	3,087	5,468	18	32	152	232	757	808	28,096	8,650	*159,658		Nil		Nil	3,484	4,043	11	...	...
Singapore ...	13,774	22,281	257	237	1,185	194	969	17,932		123,843		35,174		207,642		12,347	23,389	275	35	169
Labuan ...	...	21	Nil	Nil	Nil	29	107	63		378		Nil		Nil		...	37	Nil	...	...
Total Straits Settlements ...	16,861	32,538	2,591	2,485	14,379	1,716	8,896	18,803	28,096	132,871	*159,658	51,280	Nil	*293,583	Nil	15,831	31,769	2,616	35	169
Total Malaya ...	16,861	44,553	29,707	31,519	179,768	17,762	*107,462	18,803	28,190	132,871	*159,821	69,782	25,848	*398,268	*160,355	15,831	45,654	28,536	185	1,016

TABLE II
DEALERS' STOCKS, IN DRY TONS

Class of Rubber	Federated Malay States	S'pore	Penang	P.We'sly M'cca. Labuan & Brunei	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	6,389	22,602	3,899	4,094	4,246	371
WET RUBBER	695	787	144	243	1,206	370
TOTAL ...	7,084	23,389	4,043	4,337	5,452	741

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to June 1941
29	30	31
Singapore ...	45,160	*273,097
Penang ...	15,680	84,543
Port Swettenham.	8,942	40,406
Malacca ...	Nil	222
TOTAL ...	69,782	*398,268

TABLE IV
DOMESTIC EXPORTS

AREA	For month	Jan. to June 1941
32	33	34
Malay States ...	44,247	264,608
Straits Settlements	4,073	23,244
MALAYA ...	48,320	287,852

CORRIGENDA to April, 1941 Malaya Rubber Statistics against F.M.S. Columns 13 and 14 substitute 14,612 and 10,059 for 15,210 and 9,461. Against Kelantan Columns 13 and 14 substitute 213 and 876 for 223 and 866. Against Malacca Column 15 substitute 2,793 for 2,801. Against S.S. Column 10 substitute 27,738 for 27,728. Table III against Singapore Column 30 substitute 47,932 for 48,548.

CORRIGENDA to May, 1941 Malaya Rubber Statistics against Johore Columns 7 and 10 substitute 5,150 and 38 for 5,177 and 11.

* Amended.

METEOROLOGICAL SUMMARY, MALAYA, JUNE, 1941.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes								Most in a day.	Number of days.							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet	Total.			Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Kuala Lumpur Aerodrome, Selangor ...	93.2	74.7	83.9	†	†	†	†	86.7	87.8	2.61	66.3	†	7	7	6	5	—	218.45	7.28	59
Port Swettenham Aerodrome, Selangor ...	92.0	73.6	82.8					88.7	87.9	1.56	39.6		8	7	—	—	—	232.05	7.73	63
Sitiawan, Perak ...	92.3	74.0	83.1					86.1	86.9	0.83	21.1		5	5	2	—	—	232.05	7.73	63
Ipoh Aerodrome, Perak ...	93.2	72.9	83.1					86.2	86.4	4.31	109.5		11	10	3	—	2	231.90	7.73	62
Temerloh, Pahang ...	93.9	73.7	83.8					88.6	89.3	2.72	69.1		8	7	4	12	—	215.95	7.20	59
Kuala Lipis, Pahang ...	90.9	73.1	82.0					85.4	86.7	3.48	88.4		8	6	5	24	1	206.90	6.90	56
Kuala Pahang, Pahang ...	89.6	76.2	82.9					88.7	89.6	5.07	128.8		12	10	5	—	1	235.15	7.84	64
Kallang Aerodrome, S'pore ...	89.3	78.7	84.0					85.0	85.9	4.22	107.2		13	9	2	—	1	219.80	7.33	60
Bayan Lepas Aerodrome Penang ...	89.6	75.3	82.5					86.6	87.1	6.42	163.1		16	13	2	—	1	213.80	7.13	57
Malacca Town, Malacca ...	87.5	76.0	81.7					86.6	87.2	3.75	95.3		10	8	3	—	3	220.70	7.36	60
Kluang, Johore ...	91.0	73.2	82.1					84.0	84.8	1.72	43.7		10	7	1	11	—	218.20	7.27	59
Mersing, Johore ...	90.6	74.0	82.3					85.8	85.5	3.96	100.6		11	8	8	—	1	230.45	7.68	62
Alor Star, Kedah ...	89.5	75.5	82.5					86.6	87.9	4.80	121.9		17	13	1	—	4	204.85	7.06	56
Kota Bahru, Kelantan ...	92.2	74.2	83.2					86.2	86.5	5.98	151.9		13	10	4	—	3	216.40	7.21	58
Kuala Trengganu, Trengganu	91.0	74.0	82.5					87.4	88.1	4.03	102.4		14	9	7	—	1	228.00	7.60	61
Labuan ...	89.2	78.0	83.6					86.8	88.5	8.07	205.0		13	11	1	—	2	214.55	7.15	58
HILL STATIONS.																				
Fraser's Hill, Pahang, 4268 ft.	77.1	64.7	70.9					74.0	74.6	1.86	47.2		10	7	1	8	2	190.10	6.34	51
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	74.9	56.0	65.5					72.9	72.0	5.82	147.8		14	11	3	1	—	191.35	6.38	51
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	74.1	61.2	67.7					*	*	6.07	154.2		13	11	1	—	2	214.55	7.15	66

* Not recorded.

† Restrictions have been placed on the supply of certain types of Meteorological infor[illegible]